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Program Hae2BPIC resulted in usable ISO spectra of three young, Herbig Ae stars: HR 5999 (A7e, t=0.6 Myr), SV Cep (a1-2e, t=1-3 Myr), and WW Vul (A1-2e, t=1-3 Myr). While too small a sample to pursue our original goal of surveying the silicate emission in these young, protoplanetary disk systems, comparison of these data with ground-based IR spectra, and published ISO observations of other HAe stars (especially the posters at PPIV) reveals the following:

- The known binary stars in the sample show signatures of partially crystalline silicate features by t=0.6 Myr, at an epoch when ostensibly single Herbig Ae stars have substantially stronger silicate emission dominated by amorphous grains. This finding may account for much of the diversity in the observed silicate profiles seen in both ground-based and other ISO programs (e.g. discussion by Waters & Waelkens, 1998, ARAA 36, 233). This material is being incorporated into a paper in collaboration with Sitko, Nuth, and Hallenbeck, currently planned for submission to Icarus.

- The known binary stars also show deficits in the optically thick continuum flux relative to coeval single stars, especially in the 60-100 micron region. Deficits at these wavelengths are consistent with tidal truncation of the disk at 1/3 of the binary star separation. However, the annealing of the warm silicate grains, whose emission originates within a few AU of the star indicates that the presence of a moderately close companion modifies the entire disk, not just the outer portions of the disk. Similar flux deficits, coupled with mm data probing the coldest portions of the disk, may prove to be a useful means of identifying binary systems in large surveys of PMS stars, such as will be carried out by SIRTF.

- Comparison of ISO spectra of 2 older, single Herbig Ae stars with recent HST STIS coronographic images indicates that the flux deficit seen in HD 163296 over 10-100 microns relative to AB Aur reflects a real deficit of material interior to 300 AU. The presence of a substantial dust excess at mm-wavelengths is reflected in the STIS data by the presence of a dust ring with interior radius at r~300 AU and thickness of approximately 60 AU. IR spectra, thus, have the potential not only to identify similar systems, potentially constraining the epoch at which gas giant planets become detectable, but also to confirm the reality of features imaged in the optical, and mm. The implications of the ISO data will be discussed in tandem with the STIS observations in papers currently slated for submission to ApJ.

Publications Resulting from this Study:

1) Grady, C. A., Perez, M. R., Bjorkman, K. S., Sitko, M. L., The P.S., De Winter, D, Grinin, V. P., Russell, R. W., Lynch, D. K., and Hanner, M. S., "The Intermittently Embedded Herbig Ae/Be Stars ISO and Ground-Based IR Observations", 1998, ApSS 255, 35.

2) Sitko, M. L., Grady, C. A., Lynch, D. K., Russell, R. W., and Hanner, M. S., 1999, "Cometary Dust in the Debis Disks of HD 31648 and HD 163296: Two "Baby" Beta Pictoris Stars", 1999, ApJ 510, 408.

3) Sitko, M. L., Grady, C. A., Lynch, D. K., Russell, R. W., and Hanner, M. S., "Accreting Gas and Dust in Pre-Main Sequence Systems" 1999, in *The Formation & Evolution of Solids in Space*, eds. J. M. Greenberg and A. Li, Kluwer Academic Publishers, pp. 513-519 (1999).

4) Grady, C. A., Sitko, M. L., Russell, R. W., Lynch, D. K., Hanner, M. S., Perez, M. R., Bjorkman, K. S., and de Winter, D. 1999, "Infalling Planetesimals in Pre-Main Sequence Stellar Systems" in Protostars & Planets IV, eds. Russell, S., Mannings, V., and Boss, A. (Tucson: University of Arizona Press), *invited review paper*, (in press, expected publication late 1999).

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The known binary stars in the sample show signatures of partially crystalline silicate features by t=0.6 Myr, at an epoch when ostensibly single Herbig Ae stars have substantially stronger silicate emission dominated by amorphous grains. The known binary stars also show deficits in the optically thick continuum flux relative to coeval single stars. Comparison of ISO spectra indicates that the flux deficit seen in HD 163296 over 10-100 microns relative to AB Aur reflects a real deficit of material interior to 300

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